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CATERPILLARS ON OAKS

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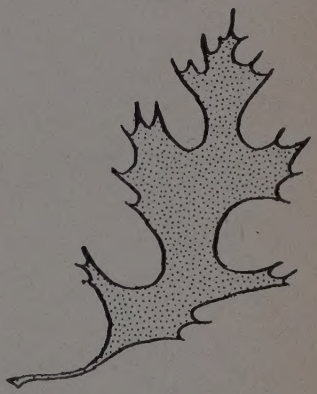

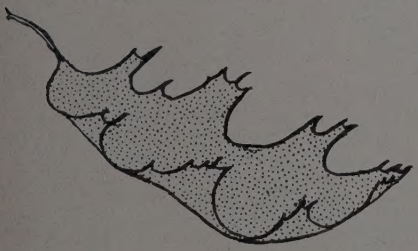

Bulletin 641
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THE CONNECTICUT
AGRICULTURAL EXPERIMENT STATION
NEW HAVEN

CATERPILLARS ON OAKS

Stephen W. Hitchcock

Oak trees are subject to depredations by a great many insects. In the last few years, there have been several outbreaks of caterpillars in different parts of the State. Fortunately, these outbreaks are usually of short duration. This circular attempts to bring together some of the knowledge gained through the years by many different entomologists in this and other states, in order to give you information on those lepidopterous pests which are most apt to cause serious defoliation to oaks in Connecticut. If you examine your trees carefully, you will see a great many different kinds of other caterpillars. However, the ones mentioned below are most likely to be numerous enough to cause serious damage and large-scale defoliation.

All of the insects discussed in this report have several life stages. The adult moths lay eggs which hatch into caterpillars or larvae. The larval stage is the only one in which the insect feeds on oak leaves. When the larvae are full grown, they enter a resting or transformation stage and are called pupae. The adult moths then emerge from the pupae to start the life cycle once more. Some of these insects repeat this cycle several times each year, others have only one generation a year.

Caterpillars feed in different ways. A "free feeder" eats all of the leaf except for the larger leaf veins. A "skeletonizer" eats the leaf in between the veins so that the leaf looks lacy when held to the light. A "miner" feeds between the upper and lower epidermis of the leaf so that the inside of the leaf is hollowed out. A "leaf roller," as the name implies, rolls up the edge of the leaf and lives and feeds within the roll.

Several species in addition to those discussed are listed only in the chart on pages 8 and 9. Other publications giving more detailed information about gypsy moth (C 186), cankerworms (C 214), oak leaf miner (C 215), and forest tent caterpillar are available on request.

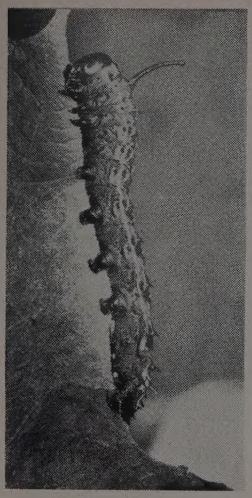

Figure. 1
Larva of the orange-striped oakworm.

Orange-striped Oakworm

Anisota senatoria (A. & S.)

Distribution. This insect may be found in all parts of the eastern United States as far west as Texas and Minnesota. Although it may be found over all of Connecticut, large populations have occurred mostly in the Connecticut River Valley and eastward.

Description. The fully grown larva is one to two inches in length. Its body, legs, and head are black with orange or yellow stripes running longitudinally down the sides and back (Fig. 1). There are two black projections arising from the mesothorax.

The moth has a wingspread of about two inches and a thick body covered with yellowish red hairs. The forewings are orangish-purple with an oblique stripe, a white spot, and numerous black dots (Fig. 2).

Life History. The moths first appear in July and are commonly attracted to lights. This is often the first warning that a householder has of an impending outbreak. The females each deposit about 100 to 200 eggs on the under side of an oak leaf. As the females are poor fliers, these eggs are usually in the lower reaches of the tree or on seedlings. It takes about 12 days for the eggs to hatch when deposited in the woods. When the eggs are on isolated trees or next to roads or open areas, they will hatch sooner.

The newly hatched larvae are greenish-yellow but have the same characteristic black mesothoracic projections as the mature larvae. The early larval instars are gregarious but later instars scatter out over the entire tree. They are free feeders, eating almost all of a leaf before moving on to another. In heavy infestations caterpillars moving over the ground in search of more food or a place to pupate migrate on to lawns and houses causing distress to homeowners. In September or October the caterpillars

burrow into the ground to pupate. The pupa may be found about an inch under the ground litter and may be recognized by its forked tail. The insect remains in this stage until the following summer when the moths emerge once more.

The larval feeding is virtually restricted to oak. As the young larvae are gregarious and start feeding in the lower parts of the tree, they are more susceptible to treatment by the homeowner than are the other lepidopterous larvae which often feed individually in all parts of the tree.

Damage. Next to the gypsy moth, this insect has probably been the most damaging pest of oaks in Connecticut for the past few years. An unprecedented outbreak defoliated about 37,000 acres in 1958, but by 1960 this area of extensive defoliation had been reduced to 26 acres. Ordinarily the pest is kept under natural control with only an occasional outbreak on a few acres or even a single tree.

Selected References. Hitchcock, S. W. 1958. The Orange-striped Oakworm. Conn. Agric. Exp. Sta. Cir. 204:1-8.

Hitchcock, S. W. 1961. Egg parasitism and larval behaviour of the Orange-striped oakworm. Jour. Econ. Ent. (in press).

Packard, A. S. 1905. Monograph of the Bombycine moths of North America. Mem. Nat. Acad. Sci. 9:107-111.

Figure 2. Adult female and eggs of the orange-striped oakworm.

Figure 3.
Larva of the
red-humped oakworm.

Red-humped Oakworm

Symmerista canicosta Franclemont
and *Symmerista albifrons* (Abbott and Smith)

Although there are two species which are generally called by the common name, red-humped oakworm, their habits and appearance are so much alike that for our purposes we may consider them together.

Distribution. This species is found in eastern North America from southern Canada to Florida and from the Atlantic Coast to Kansas and Minnesota. Outbreaks in Connecticut have occurred in central and eastern parts of the State.

Description. This colorful larva is easily recognized when full grown by its reddish amber head and a prominent orange or reddish dorsal hump on the eighth abdominal segment (Fig. 3). There are several dorsal, longitudinal black lines bordered by a yellow line. Laterally there are three black lines and then another yellow line. The legs are yellow to orange-red. It is about 1½ inches long.

The adult is undistinguished in appearance. It has a wingspread of about 1½ inches. The forewings are mottled dark brown to grey and each has an area of white along its forward edge (Fig. 4).

Life History. In Connecticut the female moth lays 40 to 70 eggs on the underside of an oak leaf in July or early August. Although this mode of oviposition is like that of the orange-striped oakworm, the latter insect deposits considerably more eggs. The eggs of both insects are subject to

Figure 4.
Adult of the red-humped oakworm, about life size.

attack by small parasites which help to reduce the population of the pest. For example, in Lebanon during 1960, *Trichogramma pretiosa* Riley and *Telenomus* sp. destroyed 33 per cent of all the eggs of the red-humped oakworm. Slightly less than 4 per cent of these eggs were infertile.

After hatching from the eggs, the young larvae feed gregariously on the surface of the leaf, near the margin (Fig. 5). In this early instar the larvae are green with black heads and with two dark "eye" spots on the dorsum of the ninth abdominal segment. Typically, if not disturbed, the young larvae line up in ranks to feed on either the top or bottom surface of the leaf. The feeding of the early instars resembles skeletonizing. Unlike the young orange-striped oakworms, the young red-humped oakworms often move from leaf to leaf still maintaining, however, their gregarious feeding pattern.

Figure 5.
Leaf injury caused by the larvae of the red-humped oakworm (right) and by the larvae of the pale tussock moth (left).

When the larvae molt to the stage in which they have orange heads, they do not remain gregarious, but scatter out over the tree. By late summer the larvae are in the late larval instars and may be recognized by the description given above. It is in this stage that they do the most damage and are most commonly seen. The mature larvae, in contrast to the young larvae, are free feeders.

Figure 6. Cocoon and pupa of the red-humped oakworm.

In the fall of the year the larvae descend to the ground and spin a loose cocoon among the ground litter in which to pupate (Fig. 6). They overwinter as pupae and then emerge the following summer as adults.

Damage. This caterpillar is quite common on oak, but rarely becomes numerous enough to do much damage. Occasionally, localized outbreaks will result in defoliation over a few acres. The larvae feed on oaks of both the white and black groups and reportedly on other tree species also. The larvae are often found in association with other caterpillars which feed on oak.

Selected References. Franclemont, J. G. 1946. A revision of the species of *Symmerista* Huebner known to occur north of the Mexican border. Can. Ent. 78:96-103.

Packard, A. S. 1895. Monograph of the Bombycine moths of America north of Mexico. Mem. Nat. Acad. Sci. 7:179-182.

Plumb, G. H., and A. DeCaprio. 1942. An outbreak of *Symmerista albifrons* (A. & S.). Conn. Agric. Exp. Sta. Bull. 461:546-547.

Argyrotaenia quercifoliana (Fitch)

Figure 7.
Moths of *Argyrotaenia quercifoliana* (left) and *Argyrotoxa semipurpana* (right), and characteristic feeding patterns.

Distribution. This insect is found in northeastern North America from Canada to the central Atlantic states and west to Missouri. As it has been found in Texas, it may also occur in the southeastern states. It may be seen in all parts of Connecticut.

Description. The mature larva of about ¾ inch is greenish white with an amber yellow head.

The adult moth with a wingspread of about ⅝ inch may be recognized by its striking pattern of irregular brown lines and spots on the cream colored forewings (Fig. 7). There are two, or sometimes three, oblique bands. The hind wings are white.

Life History. The life history of this pest is but poorly known. Damage by the insect is first noticed in May or June when the larva partly draws the upper sides

Table 1. Guide to identification of

Species	*Type and time of feeding*	*Color a full gro*
Gypsy moth	Free feeding May and June	2"; hairy, gr double row red spots
Forest tent caterpillar	Free feeding May and June	2"; pale b dorsal row hole shaped
Fall cankerworm	Skeletonizers or free feeders; eat elongate holes in leaf. May and June	1"; pale gr with narrow lines, head spins down silken threa ing worm"
Linden looper	Skeletonizers or free feeders; eat elongate holes in leaf. May and June	1½"; brown legs, 10 c lines on ba ing worm"
Argyrotoxa semipurpana	Partially roll leaf; feed on leaf margin. May and June	¾"; greeni head
Argyrotaenia quercifoliana	Leaf roller May and June	¾"; light g low head
Oak leaf miner	Leaf miner June through September	¼"; dull ye
Oak skeletonizer	Miner in early instars, skeletonizer in late instars. June to early July; late August to October	¼"; yellow
Red-humped oakworm	Free feeding; gregarious and skeletonizing in early instars. July through September	1½"; longi black and orange hea near tail
Orange-striped oakworm	Free feeding, gregarious in early instars. August to October	2"; black stripes, bla black "hor hind head

ng caterpillars on oak in Connecticut

f	*First warning of possible danger*	*Area of State where infestation most likely to occur*
dorsal and	Numerous hairy light brown egg masses on trees from July to May	West of Connecticut River
ith a key-	Many dark brown cylindrical egg masses encircling small twigs on trees from July to May	General over State
brown idinal black; ee on easur-	Numerous grey moths on tree trunks or attracted to lights in late fall	General, but more common in southern part of State
yellow black easur-	Numerous brown moths on tree trunks or attracted to lights in late fall.	Western part of State
dark	Moths numerous on shrubbery beneath oaks in June or July of year prior to damage	Northwest and southwest corners of the State
h yel-	Moths numerous on shrubbery beneath oaks in June or July of year prior to damage	Southwest corner of State
	Small mines in leaf in early summer	More common in western half of State
	Many small ribbed cocoons on leaves, tree trunks, etc., in fall and winter of year prior to outbreak	General over State
narrow stripes, hump	Young green larvae lined in rank feeding on epidermis of leaf in late July or early August	Central and eastern parts of State
orange pair of ck be-	Moths numerous at lights in late June or July	East of Connecticut River

of a leaf together with silk and feeds within the cavity so made. It remains beneath these silk threads feeding on the end of the leaf and moving progressively back as it eats. If disturbed, the larvae retreat backward in typical Tortricid fashion and drop by a thread from the leaf.

The insect pupates on the leaf and the moths emerge in June and July. The moth may be seen almost anywhere in the State by disturbing shrubbery and grass beneath oak trees in late June or early July. There is probably only one generation a year in Connecticut, but there is some evidence that an occasional second generation may occur. It is not known how this pest overwinters, although it has been suggested that it is in the egg stage. Closely related species which have two or more generations a year overwinter in the pupal stage.

Damage. This insect appears to exhibit a preference for oaks of the black oak group rather than the white, but rarely is numerous enough to cause much damage. The southwestern corner of the State is the only area where much defoliation has occurred. Some defoliation took place there in 1923-24, but only scattered infestations have appeared since then.

Selected References. Britton, W. E. 1925. Leaf roller on Pin Oak. Conn. Agric. Exp. Sta. Bull. 265:336.

Fitch, A. 1858. Oak-leaf Tortrix. Report on the noxious and other insects of the State of New York. 5:826-827.

Frost, S. W. 1928. A study of the genus *Eulia* Huebner. Penn. Agric. Exp. Sta. Bull. 225:9.

Argyrotoxa semipurpana Kearfott

Distribution. This insect is fairly common over the northeastern United States and southern Canada. It may probably be found over all of Connecticut although it becomes very numerous only in western Connecticut.

Description. The mature larva is about ¾ inch in length with a greenish, semi-transparent body and a dark head.

The small adult moth (Fig. 7) has a wingspread of about ⅝ inch and varies a great deal in its color pattern between specimens, especially when some of the wing scales have been knocked off. The forewings are commonly sulfur yellow with grayish brown markings which may take the form of two parallel bands. The intensity and extent of both the yellow and the brown vary between specimens. The hind wings are cream colored, sometimes shading into a darker gray.

Life History. The larvae are present in May and June. They feed on the edge of the leaf, but may not be noticed unless the infestation is heavy. The leaf is sometimes partially rolled at the edge and there may be slight webbing (Fig. 7). The larvae may pupate in the ground litter or on the foliage. In the latter event, the light brown pupae may be easily observed on the leaves or protruding slightly from a folded leaf. The adult moths emerge in late June or early July. These moths settle on bushes and low shrubs and, when numerous, fly up in large clouds when disturbed. This may be the first indication that the insect population is building up, and the householder should be especially watchful the following year for damage to his oaks. Reportedly, the females deposit their eggs as inconspicuous masses on the bark of a tree and the insect overwinters in the egg stage. There is apparently only one generation a year.

Damage. This insect apparently restricts its attack to members of the black oak group rather than the white oaks. There have been only scattered cases of defoliation of a few acres in Connecticut. These have all been west of the Connecticut River. In 1959, 700 to 1000 acres of oak in western Massachusetts near the Connecticut border were stripped by this pest, but no such widespread defoliation has ever been recorded in Connecticut.

Selected References. Beckwith, R. C., and E. J. Duda. 1961. Notes on leaf tiers of oak and black locust. Scientific Tree Topics 2 (8):1-2.

Britton, W. E. 1916. A Tortricid on Oak. Report of the State Entomologist of Connecticut 15:189.

Felt, E. P., and W. H. Rankin. 1932. Insects and Diseases of Ornamental Trees and Shrubs. 507 pp. (*A. semipurpana* p. 340).

Trefts, H. 1960. Aerial survey of defoliation by the oak leaf roller, *Argyrotoxa semipurpana*. Typed report, Forest Insect Laboratory of Northeastern Forest Experiment Station. 4 pp.

The Oak Skeletonizer

Bucculatrix ainsliella Murtf.

Distribution. This insect occurs in the northeastern United States and southern Canada .

Description. The full grown larva is yellowish-green and only 1/4 inch in length. The small moths have a wingspread of only 5/16 inch and are dark brown and white in color.

Life History. The female moth places her eggs on the oak leaf in May. The young larva, when it hatches, burrows into the leaf and feeds as a leaf miner. After a few weeks the larva comes out from the inside of the leaf and forms a small, flat, white patch of silk beneath which it molts. It then emerges to feed on the under surface of the leaf as a skeletonizer. When full grown, it pupates in a white 1/4-inch cocoon with longitudinal ridges (Fig. 8). The cocoons are attached to any convenient surface. The adult moths emerge from the cocoons in late July or early August and lay

Figure 8. Patches of silk (left) and ridged cocoons of the oak skeletonizer.

eggs to continue the cycle. The larvae of this second generation feed from late August to October. The insect overwinters in the cocoon.

Because this insect has two generations a year, the population can sometimes build up to considerable numbers by fall. When disturbed, the larvae drop to the ground on silken threads much like the cankerworm. However, the oak skeletonizer may be distinguished by its color and size from the cankerworm, or by the time of year in which it is found. The small ribbed cocoons are quite characteristic of the group to which this insect belongs and, when numerous, are an obvious sign of a possible build-up in numbers.

Damage. Occasionally, this insect becomes numerous enough to cause damage in localized areas. Generally, the damage is not noticed until the insects have reached the stage where they are skeletonizing the leaves. Even where the insects are not destructive, the sudden appearance of numerous white cocoons on buildings, porches, and trees can cause concern to persons unaware of their cause.

Selected References. Bray, D. F. 1957. An insect "mold." Scientific Tree Topics 2 (4):21-22.

Craighead, F. C. 1950. Insect Enemies of Eastern Forests. U.S.D.A. Miscell. Publ. 657:496-497.

Linden Looper, *Erannis tiliaria* (Harris)

Distribution. This species is found in the United States and Canada east of the Rocky Mountains. Outbreaks in this State have taken place chiefly in western Connecticut.

Description. This larva may be distinguished from most of the other caterpillars listed here by having fewer abdominal legs so that it must walk with the looping motion of a "measuring worm" much as do the cankerworms. However, the linden looper has a rusty brown head, yellow legs and yellow sides and under surface. The back has ten crinkled black lines which are separated by yellow lines (Fig. 9). When full grown, it is almost 1½ inches long.

Figure 9.
The linden looper.
Photo by Stephen Collins.

The adult male (Fig. 10) is light tan with a wingspread of slightly more than 1½ inches. There is a brown wavy line about three-fourths of the way out on the forewing and usually a brown dot in the center of each forewing. The female (Fig. 11) is wingless and about ½ inch long. It is light colored with two rows of dark brown spots down the back and scattered brown dots elsewhere on the body.

Figure 10.
Adult male of the linden looper.

Life History. The adult moths may be seen in the late fall. The brown winged males are common about houses and are attracted to lights at times of heavy infestations. The wingless females are less obvious as they crawl over the tree depositing their eggs on the bark. The eggs remain over winter and hatch the following April or May. The young larvae feed on the emergent leaves making elongate holes. They are free feeders and often so feed as to leave the leaf quite ragged. The damage caused by these larvae resembles that of the cankerworm and the two often appear simultaneously. The two may be distinguished by their size and color. In June the larvae form pupal cells in the ground and remain as pupae until fall.

Figure 11.
The wingless female.

Damage. This insect feeds on a wide variety of forest trees and causes occasional defoliation.

Selected References. Britton, W. E. 1925. The Lime Tree Winter Moth. Conn. Agric. Exp. Sta. Bull. 265:311-314.

Britton, W. E. 1936. Lime-tree Looper. Conn. Agric. Exp. Sta. Bull. 383:355.

Schoene, W. J. 1916. The Lime-tree Winter Moth. N. Y. Agric. Exp. Sta. (Geneva) Bull. 423:376-380.

Figure 12. Caterpillar of the pale tussock moth.

Caterpillars Often Numerous But Usually Not Damaging

Another caterpillar which is commonly found on oak in Connecticut is the pale tussock moth, *Halisidota tessellaris* (A. & S.). This insect can feed singly even as a first instar larva (Fig. 5) and so is not usually noticed until the larva is full grown. At this time the caterpillar is an inch or more in length (Fig. 12) with a black head and covered with thick tufts of hair which are light grey to olive in color. There are three pairs of black hair "pencils" on its body. One pair extends horizontally forward over the head, another upward vertically, and the last pair diagonally backward from the eighth abdominal segment. This caterpillar does not appear until August or September and has not been reported as an oak defoliator of any importance in Connecticut.

The variable oak leaf caterpillar, *Heterocampa manteo* (Dbldy.), as the common name implies, varies in color between specimens. When full grown the larva is more than an inch in length (Fig. 13) and may be distinguished from all but its close relatives by a black line on each side of its head which meet at the top forming a "horseshoe." The black lines on the head are bordered on the under side by a white line. The body is principally green with a thin dorsal longitudinal yellow or white stripe. On each side of this dorsal stripe, the body is colored reddish brown. Sometimes this reddish brown area is of considerable width and extends the full length of the body and at other times is represented only on certain areas of the back. The reddish brown area is in turn bordered with a yellow or white stripe. Just above the legs there is another thin yellow stripe. This caterpillar is usually found singly and, although common, has not often caused much defoliation in Connecticut. In 1959 this insect was found in conjunction with the red-humped oakworm in the eastern part of the State. This peculiar association has been noted in other areas also.

There are several Tortricidae which may be commonly found on oak although none ordinarily do much damage. They may be recognized by their method of feeding. Some roll up a leaf, holding it by silk strands,

Figure 13.
The variable oak leaf caterpillar.

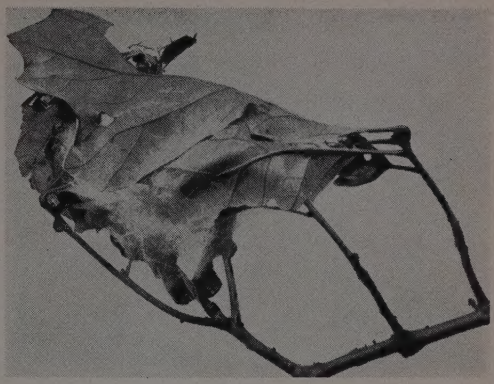

Figure 14.
Leaves tied together by larvae of a Tortricid.

and feed within. Others web several leaves together and live together in the nest. If disturbed, Tortricids usually retreat backward quite rapidly and may drop to the ground. These caterpillars are not particularly destructive, and no control is needed except possibly for aesthetic reasons.

Probably the most common of these Tortricids is *Archips fervidana* (Clem.). The full grown larva is slightly under one inch long and is green with a black head and cervical shield. The larvae live gregariously in a nest of leaves tied together with silk webbing (Fig. 14) and may be observed in June and July. The webbing is dirtied with the excreta of the larvae. The insects pupate within the nest and overwinter as eggs.

POSTSCRIPT

Table 1 (pages 8 and 9) may help you to determine what caterpillars are defoliating your oaks. The habits and appearance of a destructive pest may often be used in predicting an impending outbreak. Some indication of this is given in the table. However, the best way is to note any unusual amount of feeding during the summer, as this may possibly presage destructive defoliation the following year. The table lists those areas where outbreaks of caterpillars have most often appeared in the past but this does not mean that they cannot appear anywhere in the state.

If you are still uncertain about the identity of a caterpillar, send a specimen of the insect to The Connecticut Agricultural Experiment Station at New Haven for identification.

Oak trees are quite hardy and can survive complete defoliation. If defoliation occurs early in the summer, they will even send out new leaves. Consequently the damage often looks worse than it actually is, unless the infestation persists for two or more years. With some exceptions, there is no absolute need to apply insecticides to oaks except for aesthetic reasons. DDT applied at the proper time and dosage will give excellent control of all the insects discussed in this circular.